

# Integrated Occupational Program

## Mathematics

### Program of Studies

### Grades 8 and 9


INTERIM 1991

The IOP courses for Grades 8, 9, 10 and 11 have interim approval and are being implemented as follows:

CURRICULUM	Grades 8 and 9	- Provincial implementation, September 1989
	Grade 10	- Provincial implementation, September 1990
	Grade 11	- Provincial implementation, September 1991.

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1991  
gr.8-9

CURRGDHT



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# IOP MATHEMATICS GRADES 8 AND 9

## A. PROGRAM RATIONALE AND PHILOSOPHY

### RATIONALE

In recognition that the needs of both the individual and society may best be served through school experiences tailored to meet student needs and abilities, the *Secondary Education in Alberta* (1985) Policy Statement directs that a program be developed for students who continue to experience difficulty in learning. This program, beginning in Grade 8, will be known as the Integrated Occupational Program and will be articulated with a similar program in the senior high school. The policy statement states that:

“... the goals of the secondary schools are to assist students to ... become aware of the expectations, and be prepared for the opportunities of the workplace – expectations that will be faced as employees or employers; expectations that will be faced as entrepreneurs or volunteers ...”(p. 12)

“Opportunities must be provided to involve the community in secondary education programs and to recognize and support learning experiences which take place outside of schools.” (p. 8)

The policy statement further directs that:

“The Certificate of Achievement will be awarded to those students who, because of their abilities and needs, have taken the Integrated Occupational Program. The certificate will

recognize their achievement in that program.” (p. 23)

The Integrated Occupational Program (IOP) is designed to enable student to:

- become responsible members of society
- develop entry-level vocational abilities
- recognize the need for lifelong learning.

IOP mathematics for Grades 8 and 9 provides for the development of essential concepts, skills and attitudes required for effective computation and problem solving. The program is activity-based, and addresses the need for students to be able to transfer and apply specific mathematical concepts and skills to more generalized situations in everyday life and the world of work. The program is intended to foster an appreciation of mathematics for its usefulness and relevance, and thus motivate students to participate in the learning process.

Students need to be able to cope with the rapid pace at which change occurs in both home and work environments. A focus on effective strategies for problem solving will assist students to develop thinking skills and solve problems in new and unfamiliar situations. Students also need to understand applications of calculators and computer technologies in everyday situations involving computation and problem solving. Time spent learning mathematics can no longer be limited to practising long repetitive or tedious procedures



that are more efficiently accomplished with a calculator. A focus on the use of technology throughout the mathematics program will enable students to use calculators and computers in performing routine tasks more easily replicated by these technologies. The demands of daily living require ability to perform computation using several different methods, including mental arithmetic, estimation, the calculator and paper/pencil. A focus on computational facility and estimation skills will assist students to select and use computational procedures that are appropriate in a variety of practical situations.

Students are often unaware of strategies they may generate and employ to become more efficient in their cognitive functioning. Evidence supports, however, that students with learning difficulties can perform strategically if taught to do so. Thinking strategies that foster effective behaviours in planning, organizing and self-monitoring are emphasized throughout the program. As students learn to understand and control the outcome of tasks demanded of them, confidence in taking risks and accepting challenges will further their ability to solve problems and make informed decisions in everyday life.

Prescribed content within IOP mathematics for Grades 8 and 9 reflects an emphasis on life skills, and has been determined on the basis of the abilities and needs of students for whom the courses were designed. Nevertheless, the philosophy, goals and directions established in the Integrated Occupational Mathematics Program are consistent with those of other regular program mathematics courses. This continuity will assist students in their transition from regular program courses into IOP, and will also facilitate potential transfer of some students from IOP mathematics back into regular program mathematics courses.

## PHILOSOPHY

The need to develop programs for students with exceptional needs rests on a fundamental belief about children, as expressed in the government's *Secondary Education in Alberta* (June 1985) Policy Statement: "... a respect for the unique nature and worth of each individual" (p. 7).

The Integrated Occupational Program also rests on a number of further beliefs and assumptions about the way children learn, the overall potential of children, and their learning needs in relation to societal demands. These beliefs and assumptions have a tremendous impact on program goals, design and implementation.

There are patterns and predictability to children's learning sequences. However, each student's style and pace is unique, reflecting past experiences. Though seen as "exceptional" in their learning needs, these children nonetheless fall within the normal range of learning potential; thus every effort must be made to offer experiences that provide equitable opportunities to participate in all aspects of life.

The Integrated Occupational Mathematics Program focuses first and foremost on the needs of the learner. As attitude and self-esteem are powerful influences over learning, the program must foster in each student a positive self-concept and a positive attitude toward learning. The concepts, skills and attitudes addressed within the program must:

- provide meaningful and relevant learning experiences
- be appropriate to student ability
- provide for student success.

Students vary in the way they receive, process, recall, apply and communicate information. Each student has a preferred way of approaching learning tasks. Instructional planning must include careful assessment of each student's developmental characteristics, knowledge, skills and preferred way of learning. In order to ensure that individual student needs are being met, instructional plans may often need to be adjusted or modified.

An integrated approach suggests the linking together of various mathematical skills and strategies into meaningful activities and applications. Abstract concepts and ideas will take on new meaning and significance to students when applied to daily experiences. Organization of mathematics instruction into “themes” is intended to advance the notion of “holistic” learning, relative to both mathematics and the student. Discrete skill instruction is appropriate when specific deficiencies are noted.

Although students are at various stages of cognitive development, most will continue to use concrete operational thinking. Students will depend on personal experience and personalized content to link new ideas with prior knowledge. As the process of analysis must be based on tangible experience, learning activities should begin at the concrete level. High emphasis should be placed on experiential learning involving manipulatives and hands-on activities. Specific concepts and skills should be developed after establishing a need for their use through learning activities involving three levels of instructional technique:

- concrete (e.g., use of models)
- transitional (e.g., pictorial representation)
- formal (e.g., symbolic representation).

Direct assistance must be provided to the learner in progressing from the concrete level of thinking to the more abstract thought processes. Appropriate strategies for providing this assistance have been included in the *Program of Studies/Curriculum Guide* and corresponding *Teacher Resource Manual* (available for IOP mathematics for Grades 8 and 9 from the Learning Resources Distributing Centre).

The mathematics program must address the realities of today's society in developing the concepts, skills and attitudes that students will use in everyday life and the world of work. The demands of daily living suggest the program place emphasis on the:

- development of number sense and computational facility
- use of technologies such as the calculator and computer
- application of what is learned to a variety of problem-solving situations within a changing society.

These learning goals suggest a broader context for instruction in mathematics, and provide a focus for learning activities that are suggested throughout the program.

## B. GENERAL LEARNER EXPECTATIONS

The Integrated Occupational Mathematics Program is designed to assist students in developing and maintaining:

- positive and realistic self-images
- constructive relationships with others
- positive attitudes toward mathematics and lifelong learning.

Within IOP mathematics for Grades 8 and 9, students will be expected to:

- develop the essential concepts, skills and attitudes of mathematics that are required for responsible participation in the home, the school, the community and the workplace
- apply mathematical concepts and skills to daily life and occupational situations that are experienced both inside and outside the mathematics classroom
- develop critical and creative thinking skills, and apply these skills through a problem-solving process to a variety of practical situations
- develop the ability to use technology in its various forms
- develop communication skills that are used when learning mathematics and solving practical problems.

### Specific Learner Expectations

Specific learner expectations (learning objectives) have been identified for IOP mathematics; Grades 8 and 9, in the Statement of Content, which follows.



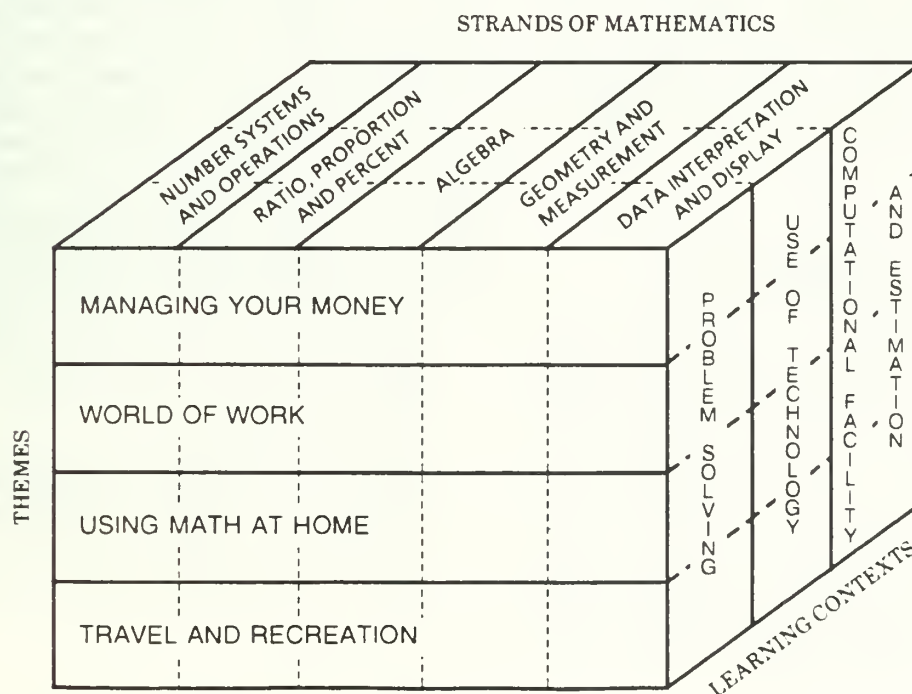
## C. STATEMENT OF CONTENT

### PROGRAM FRAMEWORK

The framework for the Integrated Occupational Mathematics Program, depicted in the model below, illustrates an integration of program dimensions. Three dimensions that provide a basis for program planning are represented in the model. Prescribed components within the mathematics program are shaded.

- The **STRANDS OF MATHEMATICS**, represented on the upper face of the model, include concepts, skills and attitudes related to five major content areas. Prescribed content within each of the strands has been determined on the basis of frequent task demands placed upon students in everyday life. The strands represent a consolidation of basic skills, and provide a foundation upon which more difficult concepts and skills may be built in the senior high school years.
- The **THEMES** provide situational and concrete learning experiences where concepts, skills and attitudes related to each of the strands and learning contexts are linked together in meaningful investigations. The themes are placed on the front face of the model to highlight their importance in planning an integrated program. Four themes that address prescribed components within the IOP mathematics Program are provided in the *Teacher Resource Manual* (available for IOP mathematics, Grades 8 and 9, from the Learning Resources Distributing Centre).
- The **LEARNING CONTEXTS**, represented on the right face of the model, focus attention on strategic behaviours that will enable students to solve problems, use technology and perform computations in daily living. Learning activities that develop these competencies should be provided in concert with activities designed to develop concepts and skills within each of the strands of mathematics.

MODEL FOR IOP MATHEMATICS IN GRADES 8 AND 9



## TIME ALLOCATION

The Integrated Occupational Mathematics Program for Grades 8 and 9 must be offered through a minimum of 100 hours of instruction at each grade level. Schools are encouraged to offer these courses through a time structure that exceeds the 100 hour minimum requirement if this will help to ensure student success.

## COMMUNITY PARTNERSHIPS

Students need to recognize the relevance of computational competence and problem-solving skills in daily life experiences within the home, community and work environments. Within this context, students will be expected to demonstrate competencies that will enable them to:

- apply mathematical concepts and skills to practical situations
- set goals, solve problems and make informed decisions
- begin to prepare for a chosen occupation or career.

Community partnerships (i.e., community-based learning experiences) will foster an appreciation of mathematics for its usefulness and relevance, and will assist students to transfer specific concepts and skills to more generalized situations in everyday life and the world of work. Community partnerships include in-school visits, demonstrations, talks, etc. given by community members; and teacher/student observations, job-shadowing, work study and work experience activities within the community.

## CURRICULAR INTEGRATION

Teachers have traditionally tended to integrate knowledge, attitudes and skills from other subject areas into their teaching speciality; however, this tendency has generally been incidental rather than by curricular and instructional design. In contrast, the Integrated Occupational Program is designed specifically to integrate related knowledge, skills and attitudes across the curriculum. In addition, teachers in the program are encouraged to adopt integrated planning and teaching strategies.

Suggestions for relating prescribed content within the mathematics program to daily life skills and applications in other subject areas across the curriculum are provided in the *Program of Studies/Curriculum Guide* and *Teacher Resource Manual* (available for IOP mathematics, Grades 8 and 9, from the Learning Resources Distributing Centre).

## REQUIRED AND ELECTIVE COMPONENTS

The required component of IOP mathematics for Grades 8 and 9 includes the concepts, skills and attitudes that all students must acquire. The learner expectations identified within this document comprise the required component of the mathematics program.

The required component of this mathematics program has been integrated into four themes at each grade level:

- Managing Your Money
- World of Work
- Using Math at Home
- Travel and Recreation.

These themes are developed in the *Teacher Resource Manual* (available for IOP mathematics, Grades 8 and 9, from the Learning Resources Distributing Centre), and include a variety of student activities intended to provide suggestions, models and strategies. Although using these themes will ensure coverage of the required component, teachers are encouraged to add, delete and alter activities to meet the abilities, needs and interests of students.

The elective component of IOP mathematics for Grades 8 and 9 permits the teacher to:

- extend or expand upon topics, thus embedding additional concepts, skills and attitudes considered appropriate to student interest and need
- enrich the program by introducing new concepts and activities considered relevant to the student and the local community
- remediate or reinforce concepts, skills and attitudes within the required component.

Students' abilities, interests and needs will largely determine how the elective component will be used. Teachers should assess student performance on an ongoing basis, and use the elective component of each course to provide individual students with remedial or enrichment activities.

Instructional time for IOP mathematics for Grades 8 and 9 should be apportioned:

- 80% Required
- 20% Elective.

## PROGRAM SEQUENCES AND TRANSFER POINTS

Students may enter the Integrated Occupational Program at either the Grade 8 or Grade 9 levels. Criteria for determining student eligibility for the Integrated Occupational Program are provided in the *Guide to Education: Junior High School Handbook* (1991-1992).

After one or two years in IOP at the junior high school level, students may transfer to regular programs, or progress in the Integrated Occupational Program at the senior high school level. Decisions regarding course sequences and transfer points throughout junior high school should reflect the achievements, needs and interests of individual students.

Teachers are encouraged to assist students in planning their high school programs. All students should become familiar with the credit requirements for graduation from senior high school, and obligatory courses for the Certificate of Achievement and/or diplomas. Information regarding high school programs and graduation requirements is outlined in the *Guide to Education: Senior High School Handbook* (1991-1992).

## SPECIFIC LEARNER EXPECTATIONS

Specific learner expectations for IOP mathematics for Grades 8 and 9 are provided on the pages that follow. Learner expectations that provide meaningful learning contexts (i.e., problem solving, use of technology, computational facility and estimation) are followed by learner expectations within five strands of mathematics (i.e., number systems and operations; ratio, proportion and percent; algebra; geometry and measurement; data interpretation and display).

Although the specific learner expectations that follow comprise the required component of each mathematics course, they are not intended to provide a sequenced plan for instruction. Prescribed concepts, skills and attitudes should be appropriately clustered and applied to progressively difficult and/or age-appropriate situations as students advance through junior high school. Teachers are encouraged to organize for instruction in ways that are consistent with the abilities, needs and interests of students, using relevant sections of the *Program of Studies/Curriculum Guide* and *Teacher Resource Manual* (available for IOP mathematics, Grades 8 and 9, from the Learning Resources Distributing Centre), locally developed themes or a combination of approaches.

Prescribed content for the Integrated Occupational Mathematics Program is developmental through Grades 8 and 9 (i.e., the spiral approach). IOP mathematics, Grade 9, provides opportunities for students to reinforce and extend their understanding of content developed in IOP mathematics, Grade 8, through more extensive applications, and prescribes new skills related to each of the five strands of mathematics. In cases where specific learner expectations are repeated in Grades 8 and 9, it is expected that teachers will help students to increase in proficiency from grade to grade even though varying levels of proficiency have not been specified.



## PROBLEM SOLVING

Problem solving is to be integrated throughout all areas of the mathematics program, as learning to solve problems is a major purpose of studying mathematics. Students should recognize that problems can be solved in many ways, and will be expected to use a variety of strategies that help them to understand problems, develop and carry out a problem-solving plan, and review/apply the results of problem solving.

Concepts, attitudes and skills related to problem solving are listed below. Learning activities that develop these competencies should be provided in concert with activities designed to develop concepts, attitudes and skills within each of the strands of mathematics.

### Specific Learner Expectations

#### Grade 8

##### Attitudes

*The student will be encouraged to:*

- display a positive attitude toward the application of concepts and skills in mathematics by
  - showing interest and curiosity through willingness to ask questions, share observations and ideas, and seek answers
  - solving mathematical problems and completing assignments independently and in cooperation with others
- appreciate the value of an organized approach to problem solving
- appreciate the role of critical and creative thinking in problem solving, and acknowledge unconventional strategies and solutions
- take risks and display perseverance when solving problems
- appreciate the usefulness of problem-solving skills within the home, the community and the workplace.

##### Concepts

*The student will be expected to demonstrate an understanding that:*

- problems can be routine, requiring only the application of a known procedure/algorithm, or non-routine, where no readily apparent solution or means to a solution are evident
- a variety of strategies/skills are useful in understanding and solving mathematical problems
- computational facility, involving the use of paper-and-pencil algorithms, estimation, mental arithmetic and/or the calculator may assist the problem-solving process.

#### Grade 9

##### Attitudes

*The student will be encouraged to:*

- display a positive attitude toward the application of concepts and skills in mathematics by
  - showing interest and curiosity through willingness to ask questions, share observations and ideas, and seek answers
  - solving mathematical problems and completing assignments independently and in cooperation with others
- appreciate the value of an organized approach to problem solving
- appreciate the role of critical and creative thinking in problem solving, and acknowledge unconventional strategies and solutions
- take risks and display perseverance when solving problems
- appreciate the usefulness of problem-solving skills within the home, the community and the workplace.

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- a variety of strategies/skills are useful in understanding and solving mathematical problems
- computational facility, involving the use of paper-and-pencil algorithms, estimation, mental arithmetic and/or the calculator may assist the problem-solving process.

## Specific Learner Expectations

### Grade 8

#### **Skills**

*The student will be expected to demonstrate an ability to:*

- apply strategies/skills that are useful in understanding a problem
  - e.g., – reads the problem several times
  - asks questions
  - identifies key words and their meanings
  - looks for patterns
  - identifies wanted, given and needed information
  - identifies extraneous information
  - internalizes the problem by restating in one's own words, or by visualizing the problem
  - draws pictures/diagrams
  - uses concrete manipulatives.
  
- apply strategies/skills that are useful in developing and carrying out a problem-solving plan
  - e.g., – guesses and checks the result (thus improving the guess)
  - uses logic or reason
  - chooses and sequences the operations needed
  - sorts and classifies information
  - applies selected strategies
  - presents ideas clearly
  - selects appropriate calculating/measuring devices and methods
  - visualizes the problem
  - acts out or simulates the problem
  - applies patterns
  - estimates the answer
  - documents the process used
  - works with care
  - works in a group situation, sharing ideas
  - speaks to self with positive statements (e.g., "I can solve this.").

### Grade 9

#### **Skills**

*The student will be expected to demonstrate an ability to:*

- apply strategies/skills that are useful in understanding a problem
  - e.g., – reads the problem several times
  - asks questions
  - identifies key words and their meanings
  - looks for patterns
  - identifies wanted, given and needed information
  - identifies extraneous information
  - internalizes the problem by restating in one's own words, or by visualizing the problem
  - draws pictures/diagrams
  - uses concrete manipulatives
  - interprets pictures/charts/graphs
  - simulates or models the problem situation
  - relates the problem to other problems previously encountered.
  
- apply strategies/skills that are useful in developing and carrying out a problem-solving plan
  - e.g., – guesses and checks the result (thus improving the guess)
  - uses logic or reason
  - chooses and sequences the operations needed
  - sorts and classifies information
  - applies selected strategies
  - presents ideas clearly
  - selects appropriate calculating/measuring devices and methods
  - visualizes the problem
  - acts out or simulates the problem
  - applies patterns
  - estimates the answer
  - documents the process used
  - works with care
  - works in a group situation, sharing ideas
  - speaks to self with positive statements (e.g., "I can solve this.")



## Grade 8

### Skills (continued)

- apply strategies/skills that are useful in reviewing and applying the results of problem solving
  - e.g.,
    - states an answer to the problem
    - restates the problem with an answer
    - explains the answer in oral/written form
    - determines if the answer is reasonable
    - discusses with others the process used
    - suggests other ways to solve the problem
    - checks the answer
    - considers the possibility of other answers/solutions.

## Grade 9

### Skills (continued)

- uses a simpler problem (make an analogy)
  - identifies factors relevant to the problem
  - collects and organizes data into diagrams, charts, tables, pictures, graphs or models
  - experiments through the use of manipulatives
  - breaks the problem down into smaller parts.
- apply strategies/skills that are useful in reviewing and applying the results of problem solving
    - e.g.,
      - reviews and applies results
      - restates the problem with the answer
      - explains the answer in oral/written form
      - determines if the answer is reasonable
      - discusses with others the process used
      - suggests other ways to solve the problem
      - checks the answer
      - considers the possibility of other answers/solutions
      - makes and solves similar problems.

## USE OF TECHNOLOGY

Students will be expected to develop an understanding of the pervasiveness of technology, its advantages and limitations in society, and strategies for harnessing its potential in productive ways. All students shall have appropriate calculators available for use throughout the mathematics program. To the extent that computer facilities and equipment are available, students will be expected to work independently with prepared software, and use simple programs that have been written for particular purposes.

Concepts, attitudes and skills related to the use of technology are listed below. Learning activities that develop these competencies should be provided in concert with activities designed to develop concepts, attitudes and skills within each of the strands of mathematics.

## Specific Learner Expectations

### Grade 8

#### Attitudes

*The student will be encouraged to:*

- demonstrate confidence in ability to use a calculator effectively in problem-solving situations that require quantitative thinking and computational facility
- appreciate current and potential impacts of computer technology in everyday and work-related situations.

#### Concepts

*The student will be expected to demonstrate an understanding that:*

- calculators and computers have influenced the nature of the computational procedures and problem-solving processes that we use
- computer technologies have basic capabilities and limitations that determine the nature of the tasks they perform
- effective use of calculators and computers requires knowledge of appropriate procedures for their use.

#### Skills

*The student will be expected to demonstrate an ability to:*

- identify appropriate and inappropriate uses of the calculator
- identify and use basic functions on the calculator (+, -,  $\times$ ,  $\div$ , =, decimal, clear)
- clear and correct entry errors
- use a calculator to add, subtract, multiply, and divide whole numbers and decimals
- enter numbers in correct sequence for subtraction and division
- determine whole number remainders for division
- follow order of operations
- select from calculator display the number of decimal places appropriate to the context of a calculation
- check the reasonableness of answers obtained on the calculator
- identify major parts of a computer
- distinguish between hardware and software

### Grade 9

#### Attitudes

*The student will be encouraged to:*

- demonstrate confidence in ability to use a calculator, effectively in problem-solving situations that require quantitative thinking and computational facility
- appreciate current and potential impacts of computer technology in everyday and work-related situations.

#### Concepts

*The student will be expected to demonstrate an understanding that:*

- calculators and computers have influenced the nature of the computational procedures and problem-solving processes that we use
- computer technologies have basic capabilities and limitations that determine the nature of the tasks they perform
- effective use of calculators and computers requires knowledge of appropriate procedures for their use.

#### Skills

*The student will be expected to demonstrate an ability to:*

- identify appropriate and inappropriate uses of the calculator
- identify and use basic functions on the calculator (+, -,  $\times$ ,  $\div$ , =, decimal, clear)
- clear and correct entry errors
- use a calculator to add, subtract, multiply, and divide whole numbers and decimals
- enter numbers in correct sequence for subtraction and division
- determine whole number remainders for division
- follow order of operations
- select from calculator display the number of decimal places appropriate to the context of a calculation
- check the reasonableness of answers obtained on the calculator
- identify and use the percent function on the calculator
- generate sets of multiples for a given number using the calculator
- identify major parts of a computer
- distinguish between hardware and software

### Grade 8

#### **Skills (continued)**

- explain how computers get their instructions from a program written to accomplish a specific task
- give examples of the applications of computers in performing tasks that require speed, accuracy, repeated operations and the processing of large amounts of data
- identify major areas in society where computers are used and the tasks performed by computers in these areas
- give examples of tasks that computers cannot accomplish.

### Grade 9

#### **Skills (continued)**

- explain how computers get their instructions from a program written to accomplish a specific task
- give examples of the applications of computers in performing tasks that require speed, accuracy, repeated operations and the processing of large amounts of data
- identify major areas in society where computers are used and the tasks performed by computers in these areas
- give examples of tasks that computers cannot accomplish.

## **COMPUTATIONAL FACILITY AND ESTIMATION**

Students will be expected to develop an understanding that there are several ways to perform numerical computations, and that the method chosen will depend upon the situation at hand. All students will develop strategies for performing computations through the use of mental arithmetic, paper and pencil, the calculator and estimation. Students will also be expected to discern when each method is most appropriately used in everyday problem-solving situations, and to determine whether or not answers are reasonable.

Concepts, attitudes and skills related to computational facility and estimation are listed below. Learning activities that develop these competencies should be provided throughout the mathematics program within the context of "real life" situations, and in concert with activities designed to develop concepts, attitudes and skills within each of the strands of mathematics.

### **Specific Learner Expectations**

#### Grade 8

##### **Attitudes**

*The student will be encouraged to:*

- demonstrate flexibility and ingenuity when selecting and applying appropriate methods of computation in daily life and work-related situations
- appreciate the usefulness of computational facility and estimation in solving everyday problems and making informed decisions.

##### **Concepts**

*The student will be expected to demonstrate an understanding that:*

- computation can be performed by a variety of methods, and may include the use of mental arithmetic, paper-and-pencil algorithms, estimation and the calculator

#### Grade 9

##### **Attitudes**

*The student will be encouraged to:*

- demonstrate flexibility and ingenuity when selecting and applying appropriate methods of computation in daily life and work-related situations
- appreciate the usefulness of computational facility and estimation in solving everyday problems and making informed decisions.

##### **Concepts**

*The student will be expected to demonstrate an understanding that:*

- computation can be performed by a variety of methods, and may include the use of mental arithmetic, paper-and-pencil algorithms, estimation and the calculator



## Grade 8

### Concepts (continued)

- one must consider the degree of precision/accuracy that is required when selecting a method of computation that is appropriate to a particular problem situation
- checking an answer for its reasonableness and accuracy is a fundamental step in the computational process
- estimation is useful in determining the reasonableness of the results of computation and problem solving.

### Skills

*The student will be expected to demonstrate an ability to:*

- use mental arithmetic skills that are based upon
  - all single-digit operations
  - sequences of operations
  - doubling and halving
  - multiplying and dividing by powers of 10
  - applications of the commutative, associative and distributive properties
  - properties of zero and one
  - strategies appropriate to the situation (e.g., compensation, computing from left to right)
- use paper-and-pencil algorithms to perform computations with whole numbers, decimals, fractions, and percent within parameters established for the program (see Number Systems and Operations; Ratio, Proportion and Percent)
- use the calculator to perform computations with whole numbers, decimals, fractions, and percent within parameters established by the nature of the problem (see Use of Technology)
- use estimation skills that are based upon
  - stating the largest and smallest reasonable answer to a problem before solving the problem
  - predicting whether a computation will result in a larger or smaller number
  - forecasting an order of magnitude for the result of a computation (e.g., 10's, 100's, 1000's)
  - predicting the magnitude of the result of a computation through use of strategies appropriate to the situation (e.g., front-end estimation, rounding, clustering, compatible numbers).

## Grade 9

### Concepts (continued)

- one must consider the degree of precision/accuracy that is required when selecting a method of computation that is appropriate to a particular problem situation
- checking an answer for its reasonableness and accuracy is a fundamental step in the computational process
- estimation is useful in determining the reasonableness of the results of computation and problem solving.

### Skills

*The student will be expected to demonstrate an ability to:*

- use mental arithmetic skills that are based upon
  - all single-digit operations
  - sequences of operations
  - doubling and halving
  - multiplying and dividing by powers of 10
  - applications of the commutative, associative and distributive properties
  - properties of zero and one
  - strategies appropriate to the situation (e.g., compensation, computing from left to right)
- use paper-and-pencil algorithms to perform computations with whole numbers, decimals, fractions, and percent within parameters established for the program (see Number Systems and Operations; Ratio, Proportion and Percent)
- use the calculator to perform computations with whole numbers, decimals, fractions, and percent within parameters established by the nature of the problem (see Use of Technology)
- use estimation skills that are based upon
  - stating the largest and smallest reasonable answer to a problem before solving the problem
  - predicting whether a computation will result in a larger or smaller number
  - forecasting an order of magnitude for the result of a computation (e.g., 10's, 100's, 1000's)
  - predicting the magnitude of the result of a computation through use of strategies appropriate to the situation (e.g., front-end estimation, rounding, clustering, compatible numbers).

## NUMBER SYSTEMS AND OPERATIONS

Students will be expected to demonstrate knowledge of the basic properties of whole numbers, decimals, fractions and integers, and of appropriate strategies for performing operations with these numbers. Instructional activities should provide opportunities for students to build concepts and demonstrate understandings through the use of concrete models and materials.

Concepts, attitudes and skills within this strand of mathematics are listed below. Learning activities that develop these competencies should be provided throughout the mathematics program within the context of real life and work-related situations, rather than as a topic on their own.

### Specific Learner Expectations

#### Grade 8

##### Attitudes

*The student will be encouraged to:*

- appreciate the usefulness of whole numbers, decimals, fractions and integers in practical everyday activities and work-related situations
- display an attitude of curiosity and openness to new ideas, and be critical and constructive when selecting and applying computational procedures in problem-solving situations.

##### Concepts

*The student will be expected to demonstrate an understanding that:*

- effective use of whole numbers, decimals, fractions and integers requires knowledge of appropriate notation and number properties
- performing operations of addition, subtraction, multiplication and division with whole numbers, decimals, and fractions involves the application of certain processes
- checking an answer for reasonableness and accuracy is a fundamental step in performing operations with number systems
- computation with whole numbers, decimals, and fractions may involve the use of paper-and-pencil algorithms, estimation, mental arithmetic and/or the calculator.

#### Grade 9

##### Attitudes

*The student will be encouraged to:*

- appreciate the usefulness of whole numbers, decimals, fractions and integers in practical everyday activities and work-related situations
- display an attitude of curiosity and openness to new ideas, and be critical and constructive when selecting and applying computational procedures in problem-solving situations.

##### Concepts

*The student will be expected to demonstrate an understanding that:*

- effective use of whole numbers, decimals, fractions and integers requires knowledge of appropriate notation and number properties
- performing operations of addition, subtraction, multiplication and division with whole numbers, decimals, and fractions involves the application of certain processes
- checking an answer for reasonableness and accuracy is a fundamental step in performing operations with number systems
- computation with whole numbers, decimals, and fractions may involve the use of paper-and-pencil algorithms, estimation, mental arithmetic and/or the calculator. mental arithmetic and/or the calculator.



## Grade 8

### **Skills**

#### **Whole Numbers**

*The student will be expected to demonstrate an ability to:*

- identify place value to one hundred thousand
- read and write whole numbers to one hundred thousand in context
- quantify and order numbers to one hundred thousand in applications
- round numbers to nearest 10, 100, 1000
- count by multiples of 2, 3, 4, 5, 6, 10 and 12
- add and subtract whole numbers (limit for paper-and-pencil computation: numbers less than 10 000).
- recall products for numbers up to  $10 \times 10$
- use mental arithmetic to determine products when multiplying by 10, 100, 1000
- recall division facts for dividends up to 100
- describe different methods of representing division
- multiply and divide whole numbers (limit for paper-and-pencil computation: numbers less than 1000 by numbers less than 10)
- apply the properties of numbers and operations to computational activities (e.g., properties of zero and one, commutative/associative/distributive properties)
- apply rules for the order of operations.

## Grade 9

### **Skills**

#### **Whole Numbers**

*The student will be expected to demonstrate an ability to:*

- identify place value to one hundred thousand
- read and write whole numbers to one hundred thousand in context
- quantify and order numbers to one hundred thousand in applications
- round numbers to nearest 10, 100, 1000
- count by multiples of 2, 3, 4, 5, 6, 10 and 12
- use a calculator to generate a set of multiples for a given number
- determine the lowest common multiple for pairs of numbers less than 10
- add and subtract whole numbers (limit for paper-and-pencil computation: numbers less than 10 000).
- recall products for numbers up to  $10 \times 10$
- identify pairs of factors related to products up to 100
- identify prime numbers up to 50
- express numbers up to 50 as the product of prime factors
- determine the greatest common factor for pairs of numbers less than 50
- use mental arithmetic to determine products when multiplying by 10, 100, 1000
- recall division facts for dividends up to 100
- describe different methods of representing division
- multiply and divide whole numbers (limit for paper-and-pencil computation: numbers less than 1000 by numbers less than 100)
- apply the properties of numbers and operations to computational activities (e.g., properties of zero and one, commutative/associative/distributive properties)
- apply rules for the order of operations.

## Grade 8

### Skills (continued)

#### Decimals

*The student will be expected to demonstrate an ability to:*

- identify place value to thousandths
- read and write decimals to thousandths in context
- quantify and order decimals to thousandths in applications
- round to nearest whole number, tenth and hundredth
- add and subtract decimals (limit for paper-and-pencil computation: numbers to hundredths)
- multiply decimals (limit for paper-and-pencil computation: numbers that yield products to thousandths, using one-digit multipliers)
- divide decimals (limit for paper-and-pencil computation: numbers having three digits or less by one-digit whole number divisors; dividend may have 0, 1 or 2 decimal places)
- use mental arithmetic to determine products/quotients when multiplying/dividing decimals by 10 and 100.

#### Fractions

Students will be expected to develop an understanding of basic skills related to fractions through the use of real-life models and concrete manipulatives. Instructional emphasis should be placed on fractions having denominators of 2, 3, 4, 5, 8 and 10.

*The student will be expected to demonstrate an ability to:*

- illustrate the use of fractions in describing part of a whole, group, or point on a number line
- illustrate the relationship between whole numbers, decimals and fractions using a number line
- describe proper fractions, improper fractions and mixed numbers through the use of objects, pictures and diagrams
- convert improper fractions to mixed numbers, and vice versa
- quantify and order fractions in applications
- identify and determine equivalent fractions
- identify and express fractions in basic form

## Grade 9

### Skills (continued)

#### Decimals

*The student will be expected to demonstrate an ability to:*

- identify place value to thousandths
- read and write decimals to thousandths in context
- quantify and order decimals to thousandths in applications
- round to nearest whole number, tenth and hundredth
- add and subtract decimals (limit for paper-and-pencil computation: numbers to hundredths)
- multiply decimals (limit for paper-and-pencil computation: numbers that yield products to thousandths, using one- or two-digit multipliers)
- divide decimals (limit for paper-and-pencil computation: numbers having three digits or less by one- or two-digit whole number divisors; dividend may have 0, 1 or 2 decimal places)
- use mental arithmetic to determine products/quotients when multiplying/dividing decimals by 10, 100 and 1000.

#### Fractions

*The student will be expected to demonstrate an ability to:*

- illustrate the use of fractions in describing part of a whole, group, or point on a number line
- illustrate the relationship between whole numbers, decimals and fractions using a number line
- describe proper fractions, improper fractions and mixed numbers through the use of objects, pictures and diagrams
- convert improper fractions to mixed numbers, and vice versa
- quantify and order fractions in applications
- identify and determine equivalent fractions
- identify and express fractions in basic form

## Grade 8

### Skills (continued)

- demonstrate addition and subtraction of proper fractions/mixed numbers with like denominators through the use of objects, pictures and diagrams
- write number sentences to describe addition and subtraction of fractions with like denominators.

## Grade 9

### Skills (continued)

- relate fractions to division and convert fractions into decimal equivalents using a calculator
- recall decimal equivalents for frequently used fractions (i.e., one-half, quarters, tenths)
- determine common denominators for fractions having denominators of 2, 3, 4, 5, 8 and 10
- demonstrate addition and subtraction of proper fractions/mixed numbers with unlike denominators through the use of objects, pictures and diagrams
- write number sentences to describe addition and subtraction of fractions with unlike denominators
- demonstrate multiplication and division of proper fractions/mixed numbers by whole numbers through the use of concrete manipulatives
- write number sentences to describe multiplication and division of proper fractions/mixed numbers by whole numbers.

### Integers

*The student will be expected to demonstrate an ability to:*

- identify applications of integers in practical everyday situations
- use vocabulary related to integers (i.e., positive, negative, plus, minus, above, below, gain, loss)
- place integers on the number line
- quantify and order integers in applications
- demonstrate addition of pairs of integers between -25 and +25 through concrete manipulation/ diagrammatic representation
- write number sentences to describe addition of integers undertaken in the concrete mode.

## RATIO, PROPORTION AND PERCENT

Students will be expected to demonstrate an understanding of ratio, proportion and percent at the concrete level through the use of objects, modes and diagrams. Instructional activities should focus attention on everyday applications of ratio, proportion and percent, and a strategy for solving related problems.

### Specific Learner Expectations

#### Grade 8

##### Attitudes

*The student will be encouraged to:*

- appreciate the usefulness of ratio, proportion and percent skills in solving consumer problems
- appreciate the importance of computational facility and critical thinking skills in evaluating information and making informed decisions in daily life and work-related situations.

##### Concepts

*The student will be expected to demonstrate an understanding that:*

- a ratio is a comparison of the relative sizes of two quantities
- a rate is a ratio between quantities that have different units
- proportions are statements about equivalent ratios
- percent is a ratio in which a quantity is compared to 100.

#### Grade 9

##### Attitudes

*The student will be encouraged to:*

- appreciate the usefulness of ratio, proportion and percent skills in solving consumer problems
- appreciate the importance of computational facility and critical thinking skills in evaluating information and making informed decisions in daily life and work-related situations.

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- a rate is a ratio between quantities that have different units
- proportions are statements about equivalent ratios
- percent is a ratio in which a quantity is compared to 100.



## Grade 8

### **Skills**

*The student will be expected to demonstrate an ability to:*

- compare two quantities in the same unit by writing ratios in the form a:b, a to b and a/b
- generate equivalent ratios using single-digit whole number constants
- verify the equivalence of two ratios using common multiples or factors  
(e.g.,  $\frac{14}{6} (+2) = \frac{7}{3}$  )
- identify proportions as statements about equivalent ratios
- write proportions that describe practical problem situations
- determine the value of the missing component in a proportion using the common factor/multiple method (e.g.,  $\frac{3}{4} (\times 25) = \frac{?}{100}$  )
- illustrate the meaning of percent as a ratio indicating parts out of 100.

## Grade 9

### **Skills**

*The student will be expected to demonstrate an ability to:*

- compare two quantities in the same unit by writing ratios in the form a:b, a to b and a/b
- generate equivalent ratios using single-digit whole number constants
- verify the equivalence of two ratios using common multiples or factors  
(e.g.,  $\frac{14}{6} (+2) = \frac{7}{3}$  )
- identify "rates" as ratios showing comparison of two numbers with different units (e.g., 90 km/2h, 3 items for \$1.00)
- identify proportions as statements about equivalent ratios
- write proportions that describe practical problem situations
- determine the value of the missing component in a proportion using the common factor/multiple method (e.g.,  $\frac{3}{4} (\times 25) = \frac{?}{100}$  )
- illustrate the meaning of percent as a ratio indicating parts out of 100
- convert whole number percents to ratios/decimals
- express ratios as percents and decimals  
(i.e.,  $\frac{a}{b} = \frac{?}{100}$  where b = 2, 4, 5, 10, 20, 25 or 50)
- express one- and two-place decimals as percents (e.g., 0.5, 0.75, 0.4)
- recall fraction, decimal and percent equivalents for one-half, quarters and tenths
- determine other fraction, decimal and percent equivalents through the use of the calculator
- calculate/estimate a percent of a number in relevant applications.

## **ALGEBRA**

Students will be expected to demonstrate an understanding of algebraic thought and process by generalizing arithmetical patterns and relationships that are present in concrete situations, and writing expressions/equations that describe the patterns and relationships they discover. Students will use substitution and simple equation-solving strategies to solve practical problems involving familiar number patterns and relationships.



## Specific Learner Expectations

### Grade 8

#### Attitudes

*The student will be encouraged to:*

- appreciate the usefulness of algebra in describing arithmetical patterns and relationships that are present in practical situations
- appreciate the usefulness of critical and creative thinking in solving practical problems encountered within the home, the community and the workplace
- accept unconventional strategies and alternative solutions in practical problem situations.

#### Concepts

*The student will be expected to demonstrate an understanding that:*

- arithmetical patterns and relationships are present in a variety of practical everyday situations, and are useful in enabling us to draw conclusions and make predictions
- algebraic symbols can be used to write expressions/formulas/linear equations that describe familiar arithmetical patterns and relationships
- substitution and equation-solving strategies are useful in solving practical problems, and involve application of number properties and operations.

#### Skills

*The student will be expected to demonstrate an ability to:*

- distinguish between the use of variables and constants in concrete situations
- use variables to describe concrete situations (e.g., number of coins in a jar)
- use variables to write mathematical expressions that describe practical situations (e.g., if the regular price of an item is reduced by five dollars, the sale price could be represented as  $R - 5$ )
- evaluate mathematical expressions for given whole number values of the variable

### Grade 9

#### Attitudes

*The student will be encouraged to:*

- appreciate the usefulness of algebra in describing arithmetical patterns and relationships that are present in practical situations
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- accept unconventional strategies and alternative solutions in practical problem situations.

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- evaluate mathematical expressions for given whole number values of the variable

## Grade 8

### **Skills (continued)**

- use variables to write linear equations/formulas that describe practical situations (e.g., if each person at a party eats three hot dogs, the relationship between number of hot dogs and number of people can be described as  $H = 3 \times P$ )
- interpret formulas related to practical situations as word statements
- perform substitution into formulas in determining outcomes/solutions to routine problems.

## Grade 9

### **Skills (continued)**

- use variables to write linear equations/formulas that describe practical situations (e.g., if each person at a party eats three hot dogs, the relationship between number of hot dogs and number of people can be described as  $H = 3 \times P$ )
- interpret formulas related to practical situations as word statements
- perform substitution into formulas in determining outcomes/solutions to routine problems
- use concrete manipulatives to demonstrate the concept of equality
- use estimation and guess/check strategies to solve simple linear equations that describe practical situations  
e.g.,  $x + a = b$   
 $ax = b$   
 $ax + b = c$   
 $x/a = b/c$
- verify solutions to linear equations by substitution.

## **GEOMETRY AND MEASUREMENT**

Students will be expected to develop an understanding of the attributes/properties of familiar one-, two- and three-dimensional geometric figures, and to apply related patterns/relationships in solving real-life and work-related problems. Students will also be expected to estimate and measure length, area, mass, capacity, time, temperature and angles within the context of everyday applications and problem solving.

It is the policy of Alberta Education that SI units be the principal system of measurement in the curriculum of the schools in the province. The study of specific Imperial units should be related only to those that are relevant to student needs (as indicated by the demands of the workplace/community partnership sites) and should be kept to a minimum.

## Specific Learner Expectations

### Grade 8

#### Attitudes

*The student will be encouraged to:*

- appreciate geometric pattern and form present in the environment
- appreciate how geometry and measurement provide us with methods for gathering and organizing information about the physical world
- appreciate the ways in which geometry and measurement affect our daily activities and contribute to the problem-solving process.

#### Concepts

*The student will be expected to demonstrate an understanding that:*

- geometry is a visual approach to organizing and interpreting our perceptions of the environment and physical world
- there are basic concepts, patterns and relationships associated with one-, two- and three-dimensional geometric figures
- the selection of units and tools of measurement must always be based upon the physical attributes of the object being measured
- estimation and measurement are iterative and comparative in nature
- a mental frame of reference is useful in establishing the size of standard units of measure, relative to each other and to real objects
- geometry and measurement contribute to the problem-solving process, and have application in activities we engage in as citizen, consumer and worker.

#### Skills

##### Geometry

*The student will be expected to demonstrate an ability to:*

- identify and distinguish between horizontal, vertical, perpendicular, parallel and intersecting lines
- identify/classify/describe basic two-dimensional figures (i.e., rectangle, square, triangle, circle)

### Grade 9

#### Attitudes

*The student will be encouraged to:*

- appreciate geometric pattern and form present in the environment
- appreciate how geometry and measurement provide us with methods for gathering and organizing information about the physical world
- appreciate the ways in which geometry and measurement affect our daily activities and contribute to the problem-solving process.

#### Concepts

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#### Skills

##### Geometry

*The student will be expected to demonstrate an ability to:*

- identify and distinguish between horizontal, vertical, perpendicular, parallel and intersecting lines
- identify/classify/describe basic two-dimensional figures (i.e., rectangle, square, triangle, circle)

## Grade 8

### Skills (continued)

- use geometric tools (i.e., protractor, compass, straightedge, ruler, computer) to construct rectangles, squares, triangles and circles according to given specifications
- identify and construct models of basic three-dimensional figures (i.e., rectangular prism, cube, cylinder).

### Length

*The student will be expected to demonstrate an ability to:*

- identify common metric units of length (i.e., mm, cm, m, km)
- estimate/measure length, selecting metric units and tools appropriate to the situation
- draw lines according to given specifications, using metric units and tools
- convert measurements of length among commonly used metric units
  - among mm, cm and m
  - between m and km
- illustrate the idea of perimeter, and explain its application to problem-solving situations
- estimate/measure/compute the perimeter of figures bounded by line segments.

## Grade 9

### Skills (continued)

- identify and recall characteristics of the parallelogram, hexagon and octagon
- use geometric tools (i.e., protractor, compass, straightedge, ruler, computer) to construct rectangles, squares, triangles and circles according to given specifications
- use geometric tools (i.e., protractor, compass, straightedge, ruler, computer) to construct the parallelogram, hexagon and octagon
- identify and describe the relationship between the radius and diameter of a circle
- draw circles, given either radius or diameter
- construct geometric patterns/designs, using tools that may include the straightedge, compass, ruler, protractor, mira or computer)
- identify and construct models of basic three-dimensional figures (i.e., rectangular prism, cube, cylinder).

### Length

*The student will be expected to demonstrate an ability to:*

- identify common metric units of length (i.e., mm, cm, m, km)
- estimate/measure length, selecting metric units and tools appropriate to the situation
- draw lines according to given specifications, using metric units and tools
- convert measurements of length among commonly used metric units
  - among mm, cm and m
  - between m and km
- illustrate the idea of perimeter, and explain its application to problem-solving situations
- estimate/measure/compute the perimeter of figures bounded by line segments.



## Grade 8

### Skills (continued)

#### Mass

*The student will be expected to demonstrate an ability to:*

- describe mass and identify common metric units (i.e., g, kg, t)
- estimate and measure mass, selecting metric units and tools appropriate to the situation
- convert between g and kg, and between kg and t.

#### Capacity

*The student will be expected to demonstrate an ability to:*

- describe capacity and identify common metric units (i.e., mL, L)
- estimate and measure capacity, selecting metric units and tools appropriate to the situation
- convert between mL and L.

#### Time

*The student will be expected to demonstrate an ability to:*

- use a calendar, and explain the relationship between days, weeks, months and years
- use accepted standards for numeric dating
- estimate/measure/record time on the 12-hour and 24-hour clocks, using traditional and digital time pieces.

## Grade 9

### Skills (continued)

#### Area

*The student will be expected to demonstrate an ability to:*

- illustrate the idea of area, identifying common metric units (i.e.,  $\text{cm}^2$ ,  $\text{m}^2$ ) and their application in problem situations
- approximate the area of two-dimensional geometric figures using a square grid
- apply strategies/formulas for finding the area of rectangles and squares
- estimate/calculate area of rectangles and squares, using units and strategies appropriate to the situation.

#### Mass

*The student will be expected to demonstrate an ability to:*

- describe mass and identify common metric units (i.e., g, kg, t)
- estimate and measure mass, selecting metric units and tools appropriate to the situation
- convert between g and kg, and between kg and t.

#### Capacity

*The student will be expected to demonstrate an ability to:*

- describe capacity and identify common metric units (i.e., mL, L)
- estimate and measure capacity, selecting metric units and tools appropriate to the situation
- convert between mL and L.

#### Time

*The student will be expected to demonstrate an ability to:*

- use a calendar, and explain the relationship between days, weeks, months and years
- use accepted standards for numeric dating
- estimate/measure/record time on the 12-hour and 24-hour clocks, using traditional and digital time pieces
- convert between hours and minutes, and between minutes and seconds
- add/subtract hours and minutes in applications.



## Grade 8

## Grade 9

### Skills (continued)

### Skills (continued)

#### Temperature

*The student will be expected to demonstrate an ability to:*

- estimate and measure temperature on the Celsius scale
- recall important temperatures on the Celsius scale (i.e., boiling/freezing point of water, normal room/body temperature)
- determine temperature change, including changes from below zero to above zero.

#### Angle

*The student will be expected to demonstrate an ability to:*

- identify an angle and the degree as a unit of measure
- identify/estimate angles of  $45^\circ$ ,  $90^\circ$ ,  $180^\circ$  and  $360^\circ$
- measure/draw angles from  $0^\circ$  to  $180^\circ$  using a protractor
- apply skills of angle measure in the construction of geometric figures/patterns/designs.

## DATA INTERPRETATION AND DISPLAY

Students will be expected to collect, organize and display numerical data in order to solve problems and make informed decisions in practical everyday situations. Instructional activities should assist students to think consistently about arguments, and justify their thinking with numerical information.

### Specific Learner Expectations

## Grade 8

## Grade 9

### Attitudes

*The student will be encouraged to :*

- appreciate the value of tables, charts and graphs in summarizing numerical data and in communicating ideas
- appreciate the need to interpret and evaluate statistical data provided through the media
- appreciate how statistics may assist the decision-making process in consumer and work-related situations.

### Attitudes

*The student will be encouraged to :*

- appreciate the value of tables, charts and graphs in summarizing numerical data and in communicating ideas
- appreciate the need to interpret and evaluate statistical data provided through the media
- appreciate how statistics may assist the decision-making process in consumer and work-related situations.

## Grade 8

### Concepts

*The student will be expected to demonstrate an understanding that:*

- throughout life, many decisions are based on numerical data
- inability to interpret numerical data in real-life situations may result in decisions that are inappropriate and consequences that are not desirable
- tables, charts and graphs are used to collect, organize and display numerical data
- statistical measures are useful in summarizing large quantities of numerical data, in communicating ideas and in predicting future outcomes or actions.

### Skills

*The student will be expected to demonstrate an ability to :*

- explain the use of statistics in real-life situations, and its effects on everyday activities
- read and interpret information presented in list, table and chart form
- collect and record data using tally sheets and frequency tables
- use tables and charts to group/sort numerical data and information according to specified criteria
- read and interpret information presented in pictographs, bar graphs and line graphs.

## Grade 9

### Concepts

*The student will be expected to demonstrate an understanding that:*

- throughout life, many decisions are based on numerical data
- inability to interpret numerical data in real-life situations may result in decisions that are inappropriate and consequences that are not desirable
- tables, charts and graphs are used to collect, organize and display numerical data
- statistical measures are useful in summarizing large quantities of numerical data, in communicating ideas and in predicting future outcomes or actions.

### Skills

*The student will be expected to demonstrate an ability to :*

- explain the use of statistics in real-life situations, and its effects on everyday activities
- read and interpret information presented in list, table and chart form
- collect and record data using tally sheets and frequency tables
- use tables and charts to group/sort numerical data and information according to specified criteria
- read and interpret information presented in pictographs, bar graphs and line graphs
- display data in the form of pictographs, bar graphs and line graphs
- read and interpret information presented in circle graphs
- explain how graphs may sometimes provide misleading information or distort the "true picture"
- interpret and determine the arithmetical average in practical situations.

## D. LEARNING RESOURCES

### BASIC LEARNING RESOURCES

Pogue, Paul, et al. *Mathbase 1: Essential Math Skills*. Second edition. Toronto, Ontario: Copp Clark Pitman, 1989.

Pogue, Paul, et al. *Mathbase 2: Practical Skills and Applications*. Second edition. Toronto, Ontario: Copp Clark Pitman, 1990.

*Mathbase 1: Essential Math Skills* provides for the focused development of prescribed content in IOP mathematics, Grades 8 and 9. *Mathbase 2: Practical Skills and Applications* provides thematic application of prescribed content in IOP mathematics, Grades 8 and 9. It is suggested that appropriate sections of both *Mathbase 1* and *Mathbase 2* be used throughout the IOP Mathematics Program in Grades 8 and 9.

### SUPPORT LEARNING RESOURCES

Support learning resources are identified in the *Program of Studies/Curriculum Guide* and *Teacher Resource Manual* (available for IOP mathematics, Grades 8 and 9, from the Learning Resources Distributing Centre).

[illegible]

DATE DUE SLIP

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